

Channel Islands National Park Seabird Monitoring Program Review November 8-9, 2000

Kevin Lafferty, USGS-BRD, WERC, Channel Islands Field Station, Marine Science Institute, University of California, Santa Barbara CA 93106

Introduction

The Channel Islands is a nationally recognized seabird breeding area which is a key component in the metapopulation dynamics of wide-ranging species which, as apex predators, provide insight into the health of ocean ecosystems. Some of these species are in decline and, for several, the Channel Islands provide important habitat necessary for their persistence.

The Channel Islands National Park implemented a biological monitoring program in the late 1980's, with long-term funding through the National Park Service (NPS) Inventory and Monitoring program. Twelve different monitoring protocols were designed to describe communities and populations and track long-term trends in terrestrial and marine systems of the Park. Protocols that have been implemented include vegetation, landbirds, small mammals, herpetofauna, seabirds, rocky intertidal systems, kelp forests, beaches and sandy lagoons, and weather. Between 5 and 15 years of data have been collected across these protocols, and some of them have sufficient information for trend analysis. An important component of the Channel Islands monitoring program is periodic review of the data, to determine whether adjustments in sampling techniques, study design or data handling could make the program better. A group of scientists reviewed the kelp forest program in 1996, and the landbird, vegetation, seabird, and rocky intertidal programs are being reviewed in 2000.

A technical review of the seabird program was held November 8-9, 2000. A group of experts (Table 1) used presentations of the goals of the seabird monitoring program, seabird monitoring protocols for Anacapa, Santa Barbara and San Miguel Islands, and a power analysis of the data collected thus far as a basis for discussion. The group found that the Park's seabird program was very cost effective (\$75-\$80K budget) and was pleased with the review process, especially since it provided the first meeting for all Channel Islands Seabird researchers.

Specific objectives of the review were to:

- Ensure that the monitoring protocol is achieving the Park's objectives for its monitoring program;
- Identify the level of temporal change that can be detected with the existing protocol and the level of confidence in detecting change;
- Identify opportunities and techniques to improve power and efficiency of monitoring;
- Accommodate improvements in technology (such as data collection technology, GPS, database management software), as appropriate, into the protocols; and
- Determine if reports from the program are adequate

A revised seabird monitoring protocol handbook with a sample design that incorporates recommendations from this review will be written after follow-up discussions with the Channel Islands National Park Resource Management Team.

Review team comments on the existing program

Original program goals

Setting clear, unambiguous scientific and management goals for any monitoring program is a necessary first step in program design. Kate Faulkner presented the management goals as were stated in previous protocol design documents. Considerable time was spent articulating the original goals of the seabird monitoring protocols so that the sample design, field methods and resulting data could be realistically evaluated against the design objectives. Original program goals were:

1. Detect changes in populations of seabirds breeding in the Park over time,
2. Detect changes in distribution of seabirds breeding in the Park over time
3. Predict future trends in the number and welfare of seabirds breeding in the Park over time.

The reviewers recommended that the goals of the program be changed to:

1. Detect changes in abundance and distribution of 7 breeding seabird species in the Channel Islands over time.
2. Where feasible, use productivity, survivorship, food habits and growth rates as indicators of change.

The review team felt that the goals of the program were largely met when one considered the efforts of the partners. The review team defended the continued effort of productivity measures as these represent relatively rapid responses to environmental conditions (something that counts of long lived species could be relatively insensitive to), because such measures would help the Park better understand the effects of fisheries, recreation, contaminants, oil, exotic predators, and climatic change (See Table 2).

Protocol

Paige Martin gave a summary of the monitoring program (see Lewis and Gress 1988). The reviewers had questions about the independence of nest site (see Yee 2000) and the sensitivity of murrelets to disturbance. They also felt that the achievements of the program were high considering the low level of funding.

For all cases where a subset of nest sites were evaluated, the team (especially the statistician) had concerns that nest sites were sampled at random and that each sampling unit was independent of the others (this is discussed in more detail by Yee 2000). It is important to consider that the power analysis assumed that sampling was random and independent but the extent to which this assumption is violated can reduce the value of the data.

Potential protocol revisions/ideas (for all partners) recommended from reviewers, abbreviations as per Klimkiewicz and Robbins (1978))

Procellariiformes

ASSP: Add counts at one site with standard mark-recapture techniques. Park should coordinate with Carter and Sydeman about survey methods. Develop ability to conduct trend analysis.

BLSP: Note if possible

LHSP: Note if possible

NPS contribution

Could provide logistical support for 4-6 sampling trips to SBI and Anacapa per season but do not have funds to support adding counts. Potential methods involve sampling during the new moon with groups of 5-10 people running 3-5 nets. Trip duration at SBI = 8 days; amount of time per trip to Anacapa is yet to be determined. Data will be supplied to Sydeman and Carter for trend analysis.

Pelecaniformes

BRPE: Initiate diet studies. Supply data for trend analysis.

NPS contribution

Diet samples will be collected from chicks at SBI when it is possible to do so without causing nest abandonment (i.e. at accessible sub-colonies where all nests have chicks 4 weeks or older). Data will continue to be supplied to Gress for trend analysis.

BRCO: Compare ground counts with aerial surveys to investigate accuracy of ground counts. Investigate whether 5 day frequency of nest checks is necessary. Perhaps change sites if it's hard to get data at Anacapa. Compare Park's and Gress's Anacapa data and, if similar, consider not monitoring at both. Consider dropping productivity based on power analysis. Develop ability to conduct trend analysis.

DCCO: Anacapa Aerial surveys should be used, if possible. Consider dropping productivity based on power analysis.

PECO: Aerial surveys should be used, if possible. Consider dropping productivity based on power analysis. Develop ability to conduct trend analysis.

NPS contribution

The Park will continue to count all cormorant adults, nests, and big chicks at SBI considering it a complete or nearly complete census of the island, thereby making the power analysis by site irrelevant. Although dropping check frequency to a 10 day chick check would, on half of the years, result in a biased (decreased) estimate, the differential in the estimates of 5 and 10 day checks was only about 3% and this bias could be corrected by adjusting the data collected in years 1996-2000 to be comparable with what would have been sampled, on average, if a 10 day check frequency had been used for these data. Therefore, the Park will change to a 10 day check schedule and correct the previously collected data accordingly. The Park will compare data with aerial survey data (USGS/HSU) and monitor individual nests from sub-colonies when feasible. The Park will monitor cormorants at SBI. Data will be shared with Carter and Sydeman for conducting trend analysis. The Park will consider dropping land-based counts of DCCO and PECO, especially of Sutil Island if another partner can conduct aerial surveys and the Park could assist with scoring slides.

Charadriiformes

SNPL: Switch to sandy-beach monitoring. Evaluate techniques after recovery plan comes out.

NPS contribution

The Park will switch SNPL censuses to sandy beach monitoring program (though the protocol and observer will remain the same). Evaluate techniques after recovery plan comes out.

BLOY: Not discussed

The Park will record observations and note nesting in the SBI natural-history notebook

CAAU: Need to determine/monitor decline at Prince Island. Possibly put out more boxes (from 70 to 200, see power analysis of Xantus's Murrelets). Maybe also do survival to determine reason for decline. Evaluate the need to do prey sampling and chick growth. Develop ability to conduct trend analysis.

USGS/HSU will conduct monitoring in 2001. The Park recognizes the need for biweekly trips to Prince Island and will investigate possible partnerships and/or funding for staff time. **The Park will work to increase the nest boxes substantially if needed. The Park will band and monitor banded birds for survival and take chick weight data. The Park does not have sufficient resources at present to add night sampling for diet. **The Park will provide minimum sufficient housing for two people and transportation every two weeks March

through July. A kayak/inflatable will be provided as transportation from Cuyler Harbor to Prince Island. Work with Sydeman and Carter to see how data can be used to conduct trend analysis.

WEGU: Add one site in northern portion of Park. Consider dropping productivity of western gulls on Anacapa (see power analysis). Re-implement prey sampling. Consider monitoring survival. Determine detection probability and observer variability. Determine if counts are a census or not. There may be a problem of pooling grids due to variation in vegetation. Delineate colony boundaries with GPS.

NPS contribution

Sample-size issues suggest that the Park can not meet its goals by adding Prince Island. Although the productivity data could be useful, the Park does not have sufficient resources to increase the sampling effort for productivity in a manner needed to meet power goals on AN. For SBI and AN: collect diet samples, try to collect band information to see if the information is worth collecting annually, counts are supposed to be a census, data are presented separately and pooled, will delineate colony boundaries with GPS every 5 years.

XAMU: In order to refine population counts, evaluate possible techniques; radar, call counts, at sea surveys (in collaboration with Sydeman and Carter). Investigate options for analyzing productivity. Try nest boxes as a tool (Hatch had reservations). Evaluate whether 5 day check schedule should still drive sampling frequency. Consider that the invasive nature of sampling Xantus's Murrelets could both negatively impact the murrelet population and affect the interpretation of the monitoring data (i.e., acknowledging a potential effect of sampling on productivity). Attempt to GPS locations of sites. Develop ability to conduct trend analysis.

NPS contribution

In 2001 Carter, Martin, and Sydeman will be conducting surveys to determine how to census population (survey as much of SBI as possible, determine sites, and GPS sites). The Park will attempt to incorporate these techniques if feasible. Nest boxes have been tried and might work but only one of sixteen boxes colonized. The Park will consult with other seabird biologists and USFWS about how to reduce impacts. Sydeman has conducted a PVA for the population.

PIGU: Formalize counts using standard methods at 1 or 2 sites. During PIGU surveys, also count RHAU and TUPU at Prince Island, perhaps with assistance from the CINMS. Develop ability to conduct trend analysis.

RHAU Record observations when possible.

TUPU Record observations when possible.

NPS contribution

Formalize existing monitoring guillemots at SBI. Count guillemots and puffins when visiting Prince Island for auklet monitoring.

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| Data | Update metadata files to clarify sampling methodology. Increase readability by an outside party. Increase consistency and completeness. Determine importance of grid differences |
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The Park will, as resources and time become available, work on the data so that it is more useful for analysis by outside parties.

Power analysis and statistical concerns

Power analysis can provide a decision making tool for what types of sampling could be bolstered, kept as is or eliminated. Yee (2000) summarizes an extensive power analysis of much of the data and her full report should be referred to for details. Note that Yee (2000) elected not to conduct a power analysis on the population counts as these were viewed as censuses. This companion report provides suggestions that the present sampling effort is, with a few exceptions, meeting the revised goals for productivity of Xantus' Murrelets and Western Gulls. Unfortunately, no measures of hatching success met the goals nor did any measures of cormorants.

The original specified rate of change to be detected was a 40% change with 80% power. However, no time frame was included in the original goals, making this impossible to evaluate. The team decided on the following revision: for productivity and hatching, be able to detect a long-term change of 50% over 20 years (the equivalent of a 3.4% average change per year) and a short-term average change of 50% between two consecutive years. For population counts, detect 50% changes over 10 years (the equivalent of a 6.8% average change per year). Since the goals of the program were modified during the review process, the power analysis was subsequently modified to assess the goals (such that the new results were not available for discussion).

Of the 4 measures of long-term productivity of Western Gulls and Murrelets, the following 3 measures achieved a goal of the program: productivity of Western Gulls on Santa Barbara Is., decreased productivity of Western Gulls on Anacapa and decreased productivity of Xantus' Murrelets in Cat Canyon (SBI). Meeting goals for long term productivity of Xantus' Murrelets at Nature Trails would require at least a 3 fold increase in sampling effort.

Of the 4 measures of short-term productivity of Western Gulls and Murrelets, the following 3 measures achieved a long-term goal of the program: decreased productivity of Western Gulls on Santa Barbara Is., productivity of Xantus' Murrelets at Cat Canyon (SBI) and productivity of Xantus' Murrelets at Nature Trails (SBI). Meeting goals for short-term productivity of Western Gulls at Anacapa would require a doubling of sampling effort.

No measures of hatching success met the goals of the program. However, power to detect long-term changes in hatching of Western Gulls (SBI) might be amendable by increasing sampling effort from 180 nest sites to 250 nest sites (though this may not be tractable). It was very difficult to know what assumptions would be needed to determine the power to detect short-term changes in hatching of Xantus' Murrelets.

For Western Gulls, the number of nests surveyed in each of the five sampling grids on SB Island, and each of the three sampling grids on Anacapa Island can be treated as samples of counts, with the sampling unit being the sampling site. For both islands, there was sufficient power to satisfy the goals of the program.

No productivity or hatching measures of cormorants that could be analyzed met the goals of the program. In all cases, a very large increase in effort would be needed to meet these goals.

Yee (2000) provides trends in count data but these were only potentially applicable for double crested cormorants (see Yee's report for problems with reporting of data for this and other cormorant species). These data were treated as a census and thus power was not estimated. However, the data indicate that the counts found that over 6 years the population declined by -8% (-15% to +1% 95% confidence intervals), suggesting that the surveys meet the goal of being able to detect a 50% change over the course of 10 years. To meet its monitoring goals, the Park needs to insure that it can conduct similar trends on the other species it is tracking.

Data Management

Much historical data exist from the islands (especially George Hunt's Western Gull and Xantu's Murrelet data) and these need to be obtained and archived electronically. Doing so could greatly extend the value of the monitoring program. The team acknowledged that such an effort would require resources beyond the existing program's budget.

Seabird monitoring is an active area of research and the Park should continue its efforts to network with other groups doing this work. The Park should continue contributing data to the Pacific Seabird Monitoring Database. At present, the Park is probably the best entity to act as an archive for data in the Channel Islands. Because it will need to be sensitive to concerns about intellectual property from some researchers, the Park should work with all contributors to develop a data management/archiving strategy. One suggestion was for the Park to archive information from partners at 5-10 year intervals (see 10 year report below).

Interagency coordination

Due to the large-scale efforts to monitor seabirds in the Park, there is a need to continue coordinating efforts with other monitoring groups (particularly Carter and Gress), perhaps by meeting on an annual basis. Such meetings could serve to develop funding strategies as well as coordinate field schedules and share results. As the most permanent partner, the Park can be sure that priority monitoring needs are met annually and coordinate efforts. A multi-agency cooperative agreement or MOA might help formalize this. In some cases, efficiency could be improved by partitioning effort. The next revision of the Channel Islands seabird monitoring protocol (titled the Channel Islands Seabird Interagency Monitoring Program) should include all participants, including efforts on other islands such as Santa Catalina, San Nicolas and San Clemente. It should also include a colony catalogue (map). The partners mentioned that it was sometimes difficult to arrange housing and transportation (especially to San Miguel) and they

hoped that the Park could become more research friendly, especially considering the partners' contributions to the Parks RM goals.

Reporting

All partners should develop a simple, multi-authored report that allows interagency interaction. In other words, ideally the report (annual or less than annual) should include information from all the researchers working in the islands. At the very least, the report should contain a summary of all existing efforts. The Park is the best agency to lead this effort. However, it is important to be sensitive to the perspective that some researchers do not feel that frequent reports are necessary and tax their time. This can be solved by developing a simple reporting procedure (a template of which could be included in the handbook). The reviewers also recommended that a more detailed, data-intensive, 10 year inventory report would be a useful addition to keep track of distributional or population changes throughout the Park.

It was difficult and sometimes impossible for collected data to be used in analyses (see further discussion in Yee). In several cases, data files did not correspond to published reports, had inconsistencies in format or were otherwise difficult to interpret.

References

- Klimkiewicz K and CS Robbins 1978. Standard abbreviations for common names of birds. North American Bird Bander 3: 16-25.
- Lewis, D. B. and F. Gress 1988. Seabird Monitoring Handbook, Channel Islands National Park (Revised, originally prepared by Ingram, Gress, Hunt and Anderson in 1983).
- Yee, J. 2000. Statistical Trend and Power Analysis of CINP Seabird Monitoring Data.

Table 1. Participants

1. Vernon Byrd,, Alaska Maritime National Wildlife Refuge
2. Scott Hatch, USGS-BRD, Alaska Biological Science Center
3. Dr. Julie Yee, USGS-BRD, Western Ecological Research Center, Dixon, CA
4. William J. Sydeman, Point Reyes Bird Observatory, Stinson Beach , CA
5. Harry R. Carter, USGS-BRD, Western Ecological Research Center, Dixon, CA
6. Dr. Franklin Gress, UC Davis and California Institute for Environmental Studies
7. Maura Naughton, USFWS, Pacific Northwest Region
8. Daphne Hatch, Golden Gate National Recreation Area
9. Mike McCrary, Minerals Management Service
10. Carolina Pickens, UC Irvine
11. Sarah Fangman, Channel Islands National Marine Sanctuary
12. Bridget Fahey, USFWS, Ventura Field Office
13. Dr. Kevin Lafferty, USGS-BRD, Channel Islands Field Station
14. Paige Martin, Channel Islands National Park
15. Kate Faulkner, Channel Islands National Park
16. Dan Richards, Channel Islands National Park
17. Linda Dye, Channel Islands National Park
18. Katie Chess, USGS-BRD, Channel Islands Field Station

Table 2. Threats to seabirds in the Channel Islands region

Fisheries

- Squid (disturbance from lights /change in prey base)
- Sardine/mackerel (change in prey base)
- Gillnet – driftnet for shark/swordfish (bycatch)
- Live fish (disturbance)
- Sportfishing (disturbance/bycatch)
- Kelp harvesting (disturbance)

Petroleum

- Spills (episodic mortality)
- Chronic (bioaccumulation of hydrocarbons)
- Proposed offshore development (increase in the above)

Introduced predators

- Rats

Native predators

- Barn owls
- Corvids
- Peregrines
- Gulls
- Mice

Habitat degradation

- Iceplant in nesting areas
- Elephant seals in snowy plover breeding areas

Human disturbance

- Tourism (in general) near roosts colonies,etc
 - Kayaking
 - Camping
 - Hiking
- Seabird research
- Navy seatest range
- Rescues
- Light disturbance (commercial and recreation)

Climate change

- Global warming
- Change in prey base
- Regime shifts
- Sea level changes

Contaminants

- Organochlorines
- Metals